Level:
INTERMEDIATE

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

Wind energy is becoming an increasing priority in the United States' renewable energy landscape, delivering clean, sustainable electricity to millions of homes and businesses. With wind resources being utilised across coastlines, plains and mountain ranges, the US continues to embrace wind power to make a seamless energy transition.

The US is home to over 70,000 wind turbines, each helping the US work towards ambitious climate targets by reducing greenhouse gas emissions, improving air quality, and enhancing energy security. Beyond environmental benefits, the US wind industry also boosts economic growth, creating over 120,000 jobs in turbine manufacturing, maintenance, and operations.

The US is home to over 70,000 wind turbines

(Data correct as of Jan25)

Wind turbines not only reduce carbon emissions and are a cost-effective solution, they also offer an attractive alternative to fossil fuels. The deployment of thousands of turbines aligns with the government's goals to cut greenhouse gas emissions below 2005 levels by 2030, and achieve a net-zero emissions economy by 2050.

Level:
INTERMEDIATE

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)

With this in mind, BGB set out to uncover which states across the US are leading the charge in harnessing wind energy and which states may be falling behind. To do so, we analysed six key data points to evaluate turbine shortfall and overall wind energy efficiency across the country:

This includes:

- Number of turbines in each state
- Turbine output (kWh / month)
- Number of residential homes in each state
- Average energy demand per household (kWh per month)
- Monthly state-wide energy usage of residential homes (kWh)
- Number of turbines needed to meet residential demand

US wind boosts economic growth, creating over 120,000 jobs

(Data correct as of Jan25)

Level:
INTERMEDIATE

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)

Revealed: Turbine Shortfalls Across the US

State	No. of turbines	Turbine output (kWh / month)	Number of homes	Average energy demand per household (kWh)	Average energy usage of residential homes (kWh)	Number of turbines needed to meet demand	Turbine shortfall
Iowa	6,481	5,463,483,000	1,412,789	908	1,282,812,412	1,521.72	-4,959.28
Oklahoma	5,527	4,659,261,000	1,746,807	1,142	1,994,853,594	2,366.37	-3,160.63
Texas	19,137	16,132,491,000	11,589,315	1,174	13,605,855,810	16,139.81	-2,997.19
Kansas	4,245	3,578,535,000	1,275,684	1,133	1,445,349,972	1,714.53	-2,530.47
North Dakota	2,095	1,766,085,000	370,642	1,098	406,964,916	482.76	-1,612.24
New Mexico	2,260	1,905,180,000	940,859	655	616,262,645	731.04	-1,528.96
Wyoming	1,602	1,350,486,000	271,888	894	243,067,872	288.34	-1,313.66
South Dakota	1,503	1,267,029,000	393,371	1,055	415,006,405	492.30	-1,010.70
Colorado	2,907	2,450,601,000	2,491,403	723	1,801,284,369	2,136.75	-770.25
Nebraska	1,504	1,267,872,000	844,275	1,034	872,980,350	1,035.56	-468.44
Montana	979	825,297,000	514,799	860	442,727,140	525.18	-453.82
Minnesota	2,733	2,303,919,000	2,485,558	817	2,030,700,886	2,408.90	-324.10
Oregon	2,131	1,796,433,000	1,813,746	976	1,770,216,096	2,099.90	-31.10

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)

Revealed: Turbine Shortfalls Across the US

Maine	430	362,490,000	739,072	551	407,228,672	483.07	53.07
Alaska	144	121,392,000	326,199	632	206,157,768	244.55	100.55
Vermont	73	61,539,000	334,318	569	190,226,942	225.65	152.65
Hawaii	128	107,904,000	561,065	632	354,593,080	420.63	292.63
District of Columbia	0	0	350,365	720	252,262,800	299.24	299.24
Rhode Island	35	29,505,000	483,468	602	291,047,736	345.25	310.25
Idaho	598	504,114,000	751,858	1,055	793,210,190	940.94	342.94
New Hampshire	84	70,812,000	638,799	629	401,804,571	476.64	392.64
Delaware	1	843,000	448,736	944	423,606,784	502.50	501.50
West Virginia	419	353,217,000	855,647	1,118	956,613,346	1,134.77	715.77
Utah	208	175,344,000	1,151,414	798	918,828,372	1,089.95	881.95
Illinois	3,719	3,135,117,000	5,426,429	755	4,096,953,895	4,859.97	1,140.97
Nevada	68	57,324,000	1,281,017	924	1,183,659,708	1,404.10	1,336.10
Connecticut	3	2,529,000	1,530,194	752	1,150,705,888	1,365.01	1,362.01

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)

Revealed: Turbine Shortfalls Across the US

Puerto Rico	63	53,109,000	1,598,159	900	1,438,343,100	1,706.22	1,643.22
Wisconsin	480	404,640,000	2,727,726	703	1,917,591,378	2,274.72	1,794.72
Indiana	1,651	1,391,793,000	2,923,176	1,005	2,937,791,880	3,484.93	1,833.93
Arkansas	1	843,000	1,365,265	1,133	1,546,845,245	1,834.93	1,833.93
Mississippi	59	49,737,000	1,319,942	1,220	1,610,329,240	1,910.24	1,851.24
Michigan	1,715	1,445,745,000	4,570,170	665	3,039,163,050	3,605.18	1,890.18
Washington	1,825	1,538,475,000	3,202,240	1,041	3,333,531,840	3,954.37	2,129.37
Massachusetts	92	77,556,000	2,998,548	638	1,913,073,624	2,269.36	2,177.36
Missouri	1,107	933,201,000	2,786,618	1,086	3,026,267,148	3,589.88	2,482.88
Kentucky	1	843,000	1,994,315	1,154	2,301,439,510	2,730.06	2,729.06
Maryland	80	67,440,000	2,530,846	1,031	2,609,302,226	3,095.26	3,015.26
New Jersey	6	5,058,000	3,761,240	687	2,583,971,880	3,065.21	3,059.21
South Carolina	0	0	2,344,965	1,124	2,635,740,660	3,126.62	3,126.62
Louisiana	0	0	2,073,197	1,273	2,639,179,781	3,130.70	3,130.70

Level:
INTERMEDIATE

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)

Revealed: Turbine Shortfalls Across the US

Alabama	0	0	2,288,335	1,211	2,771,173,685	3,287.28	3,287.28
Arizona	429	361,647,000	3,081,997	1,049	3,233,014,853	3,835.13	3,406.13
California	5,509	4,644,087,000	14,392,140	557	8,016,421,980	9,509.40	4,000.40
Tennessee	18	15,174,000	3,031,606	1,245	3,774,349,470	4,477.28	4,459.28
New York	1,334	1,124,562,000	8,488,064	602	5,109,814,528	6,061.46	4,727.46
Virginia	2	1,686,000	3,618,242	1,156	4,182,687,752	4,961.67	4,959.67
Ohio	502	423,186,000	5,242,526	892	4,676,333,192	5,547.25	5,045.25
Pennsylvania	766	645,738,000	5,742,837	857	4,921,611,309	5,838.21	5,072.21
Georgia	0	0	4,410,953	1,088	4,799,116,864	5,692.90	5,692.90
North Carolina	150	126,450,000	4,708,715	1,098	5,170,169,070	6,133.06	5,983.06
Florida	0	0	9,865,356	1,078	10,634,853,768	12,615.48	12,615.48

With over 6,400 turbines, Iowa generates more than 1.54 billion kWh per month—more than enough to power the 1.4 million homes in the state. The data reveals that Iowa has a surplus of over 4,000 turbines, highlighting its increased level of efficiency in wind energy production.

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)

Iowa's natural environment may be helping as the state is a national leader in wind energy. With consistent and high wind speeds across its open plains, turbines can operate at peak capacity for longer periods, producing more electricity.

Joining Iowa in the top three states are Oklahoma and Texas. With mostly open geography and strong wind resources, Texas leads the US in the number of turbines, with 19,137 turbines generating over 4.23 billion kWh per month, meaning it could power all of its 11.5 million homes with just wind power alone.

Texas has 19,137 turbines generating over 4.23 billion kWh per month

(Data correct as of Jan25)

Similarly to Iowa, Oklahoma has 5,527 turbines but can still meet the electricity demands of all 1.7 million homes with a surplus of over 3,000 turbines, infrastructure which can be put to use providing energy for its growing industrial sector.

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)

The Differences Across The States:

The amount of energy a household consumes varies across the US, influenced by factors such as climate, heating, and air conditioning needs.

For example, despite harsh winters and a regular deep freeze, average household energy demands in the state are just 632kWh per month. Despite this, Alaska does not currently have the necessary infrastructure to meet its residential energy demand by wind alone, needing 100 more turbines to meet demand.

Standing out at the bottom of the rankings is Florida. Despite being a state with a large population and high energy demands, Florida currently has no large wind turbines producing energy. Other power-hungry states such as Texas, Iowa and California have invested heavily in wind infrastructure.

Often called the “Sunshine State”, Florida has prioritised solar energy as its primary renewable source, as it is likely the most cost-effective option for meeting the state’s energy needs. The state receives 255 days of sunshine a year, making it the perfect location for solar energy generation.

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)

As well as having the most sunshine, Florida is known for its hurricanes. Extreme weather events can damage turbine infrastructure, leading to increased maintenance costs and potentially posing an investment risk.

While solar energy is a viable renewable option, relying solely on solar may have its limitations. Solar production is highly dependent on daylight hours, which can be inconsistent, especially in regions with heavy cloud cover or shorter winter days. Wind turbines can operate day and night, often producing more consistent output in areas with steady wind resources.

The Future of Wind Turbines

Becoming an energy-efficient country is a priority for the US, and dedication to this goal can be seen as early as the 2000s when some of the first wind turbines were installed in Washington state. However, technology has come a long way, and ageing turbines often have lower efficiency compared to modern models.

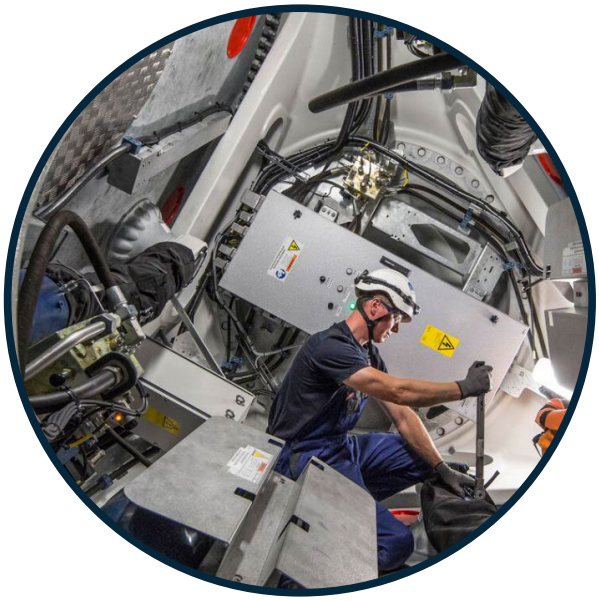
Advances in technology over the past two decades mean newer turbines are taller, more powerful, and better equipped to capture wind energy efficiently. Many turbines across the US are nearing, or exceeding, their typical lifespan of 20–25 years, raising concerns about the reliability of ageing infrastructure. Typically, older turbines require more refurbishments and may produce less energy over time.

Level:
INTERMEDIATE

THE POWER OF WIND:

How US States Are Harnessing Renewable Energy

(CONTINUED..)



States with more modern turbines, like Oklahoma and parts of the Midwest, show recent investments and expansions in wind energy, reflecting the growing recognition of wind as a cost-effective and sustainable energy source.

Older turbines across the US may indicate a plateau in wind energy development or a shift in focus to other renewable energy sources. States without wind turbines may be missing out on an opportunity to diversify their energy mix, reduce grid strain, and provide a more reliable renewable energy supply to meet residential and industrial needs.

Knowing when to refurbish a wind turbine can be tricky, but keeping it running smoothly is essential. There are plenty of ways to make sure parts, like slip rings, can be replaced easily, ensuring turbines stay in top shape.

For more information please visit: https://www.bgbinnovation.com/products/wind-turbine-spare-parts.

METHODOLOGY

Using official data from the United States Geological Survey, BGB created an index analysing six factors:

> Number of turbines in each state
> Turbine output (kWh / month)
> Number of residential homes in each state
> Average energy demand per household (kWh per month)
> Monthly state-wide energy usage of residential homes (kWh)
> Number of turbines needed to meet residential demand

Data correct as of January 2025

BGB Author:
VARIOUS
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E: education@bgbinnovation.com
@bgb_innovation